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Association Between Problematic TikTok Use, and Procrastination, Loneliness and Self-Esteem: A Stratification Analysis by Sex and Generation

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Association Between Problematic TikTok Use, and Procrastination, Loneliness and Self-Esteem: A Stratification Analysis by Sex and Generation

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Abstract

The aim of this study was to examine the association between problematic TikTok use, and procrastination, loneliness and self-esteem in Greece. Moreover, we performed a stratification analysis to explore differences between females and males, and Generation Z, Millennials and Generation X. We conducted a cross-sectional study with a convenience sample of 1033 TikTok users. We used the TikTok Addiction Scale to measure problematic TikTok use. Additionally, we measured procrastination, loneliness and self-esteem, with the Irrational Procrastination Scale, the UCLA 3-Item Loneliness Scale, and the Rosenberg Self-Esteem Scale, respectively. We performed multivariable linear regression analysis to control for confounders. We found a positive association between problematic TikTok use, procrastination and loneliness. Also, we found a negative association between problematic TikTok use and self-esteem. Stratification analysis showed a stronger association between problematic TikTok use and procrastination among females and Generation Z. The association between problematic TikTok use and loneliness was higher among males and Generation X. The association between problematic TikTok use and self-esteem was stronger among males and Generation Z. In conclusion, our study supports the association between problematic TikTok use, and procrastination, loneliness and self-esteem. Moreover, there are differences between the two sexes, and age generations.

Keywords: TikTok; procrastination; loneliness; self-esteem; TikTok Addiction Scale; sex; age

1. Introduction

A widely-known trait of our times refers to the domination of social media, which spread to gigantic numbers, becoming part of the daily life for the most part of the world, especially for young people (Statista, 2025). Using extremely updated and smart algorithms, social media can easily and detailedly "read" their users, figure out their personality and introduce to them contents of high relevancy to their taste and interest (Kim, 2017; Swart, 2021). According to the statistics, there were 5.44 billion users in 2025 which are expected to rise to 6.46 by the end of 2029 (Statista, 2025). Another immense parameter, indicating the power of social media, is the time that users spend floating in these platforms. It is reported that the daily usage of social media reaches 141 minutes in average (Statista, 2025).

Among all social media platforms, TikTok is the most prominent one. In just nine years from its initial release in China, its dynamic overcame all other social media, reaching and even exceeding the

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number of its users. In comparison to older social media platforms that took them decades to build and establish their empires, TikTok managed to outstand in less than a decade (HistoryofInformation.com,2017; Statista,2025). With the new generations spending most of their day watching videos on TikTok, it is characterized as the most powerful social media platform (Katsiroumpa et al., 2025; Statista, 2025). TikTok gathers 1.5 billion users monthly, with the 35% of its users referring to generation Z (age group of 16 to 24 years old) (Katsiroumpa et al., 2025; Statista, 2025). Both statistics and literature claim that TikTok entails a great load of addiction (Koetsier, 2024; Montag et al., 2021; Pedrouzo & Krynski, 2023). According to United States statistics, there were almost common rates among the generations regarding addiction and negative mental health association. More specifically, generation Z comes first with 77.7% of them supporting that TikTok is addictive, followed by the Millennials (73.5%) and Gen X (71.7%) (Statista, 2023).

Although those up-to-60 seconds videos that TikTok produces are usually used for casual, harmless reasons (such as informing, promotion, and updates concerning trends) and they can be a potential creative environment for self-expression, literature claims a number of concerning issues. First, it is estimated that the time users devote to TikTok may span from 52 to 150 min or more (Statista, 2025; Statista, 2025; Oberlo, 2023; Statista, 2025; Statista, 2025). This fact, along with the psychological effect TikTok reflects on users, raises addiction-related concerns. TikTok follows the exact same pathway as any other addictive habit: the dopaminergic system (Andreassen et al., 2016; Campanella, 2024; Chung, 2018). In fact, TikTok has a double way to allure and conquer its users. First, by providing joy and pleasure to the TikTokers via recognition, and secondly with the euphoria it brings by the constant consumption of videos highly relevant to users' interests and tastes. One way or another, TikTok engages its users, since both ways lead to the stimulation of the dopaminergic system and the reward mechanism, which is responsible for getting pleasure (Koetsier, 2024; Montag et al., 2021). As the individuals try to re-experience the initial pleasure by repeating it, they end up addicted, craving for more (Caponnetto et al., 2025; Koetsier, 2024; Montag et al., 2021). It is indicating that, as per 2023 statistics in United States survey, participants attributed addictive behaviors towards TikTok and effects on mental health. More specifically, 73.5% of the participants agreed that TikTok is addictive, while 26.8% blamed the platform for negative mental health as a result of TikTok usage (Statista, 2023; Statista 2023). It is indicating that 37.7% of the Millennials agreed that TikTok affects negatively their mental health (Statista, 2023).

It is also very questionable the impact of TikTok on individuals' self-esteem. The term of self-esteem refers to the degree of positive perception of one's image. According to the American Psychological Association "self-esteem reflects a person's physical self-image, view of their accomplishments and capabilities, and values and perceived success in living up to them, as well as the ways in which others view and respond to that person" (America Psychological Association, 2023). Following the findings of Bleidon et al. study among 48 nations and Kling et al. meta-analysis, self-esteem increases as individuals get older. In addition, men tend to have stronger self-esteem than women (Bleidorn et al., 2016; Kling et al., 1999). Concerning TikTok and is relationship to self-esteem literature indicates that the impact of unrealistic models and lifestyles that TikTok promotes ends up with self-esteem related problems for users (Bissonette Mink & Szymanski, 2022; Conte et al., 2025; Galanis et al., 2024). Studies suggest that women seem to be more burdened with self-esteem issues because of the constant display of ideal, non-realistic standard concerning their image. Even TikTok campaigns regarding the enhance of self-esteem fail their purpose ending to worse results concerning self-perception and self-esteem (Bissonette Mink & Szymanski, 2022; Harriger et al., 2023; Ibn Auf et al., 2023; Seekis & Kennedy, 2023).

Another important question is how TikTok isolates its users. It derives from several studies that individuals, and most frequently boys, are feeling uncomfortable and isolated when they are not online and away from social media (including TikTok). More specifically, they declare lack of communication and a feeling of isolation (Conte et al., 2025; Muñoz-Rodríguez et al., 2023; Savoia et al., 2021; Sipal et al., 2011). This finding can be explained in the context of "fear of missing out" phenomenon, where social media and internet users feel that they are missing important information

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and social updates when they go offline (Bao & Li, 2025; Li & Ye, 2022; Wu et al., 2025). These findings show that real-world connection and interpersonal touch seem to be understudied by the digital companion. In addition to the above, literature supports that loneliness is increased among TikTok users. Either due to total absence of real-world personal relationships or duo to poor quality in interpersonal connection, users tend to feel more lonely (Chao et al., 2023; Harries et al., 2025; Huang, 2017; Smith & Short, 2022). Although, studies from general population show that as people, especially women, get older they experience more loneliness (Nicolaisen & Thorsen, 2024; Pagan, 2020; Wang et al., 2023), according to Pop et al. things are reversed, meaning that the younger the users of social media are, the more lonely they feel (Pop et al., 2022).

Isolation, as has been described above, has also been correlated to procrastination (Monaghan et al., 2024). According to Oxford and Merriam-Webster Dictionaries the term of procrastination refers to the postponement and delay of doing something, either because of unwillingness or laziness (Merriam-Webster dictionary, 2025; Oxford Dictionaries, 2025). Studies have supported that social media and mobile phone addiction along with the "fear of missing out" phenomenon have been linked to procrastination especially among young people (Bao & Li, 2025; Li & Ye, 2022; Wu et al., 2025). This means that individuals are pushing their responsibilities back in order to spend more time on social media platforms, thinking that if they do so, they will stay connected to other users and updated (Fuentes Chavez κ.ά., 2025; Li & Ye, 2022; Naushad et al., 2025; Zhou et al., 2024). Smartphones and social media have been indicated responsible not only for "bet-time" but also academic procrastination among students, especially among male students (Naushad et al., 2025). According to studies, self-control seems to play a key role to the limitation of procrastination (Geng et al., 2021; Rasouli et al., 2025). Lastly, smartphone addiction has been correlated to poor mental health such as depression and anxiety due to bed-time procrastination (Geng et al., 2021). Procrastination is a major factor since it is responsible for poor academic and school performance, especially among boys who tend to skip their homework more often than girls (Chao et al., 2023; Rasouli et al., 2025; Sipal et al., 2011; Zacks & Hen, 2018). Furthermore, procrastination has been associated with poor sleep and bad quality of night-time sleep (Hill et al., 2022; Ma et al., 2022). It seems that self-control and self-regulation are key-factors related not only to bed-time sleep procrastination, but also to other types of procrastination, such as academic duties, school homework and responsibilities (Kroese et al., 2014; Rebetez et al., 2018). According to studies factors like exhaustion, stress, isolation and lack of motivation may be predictors of procrastination too (Monaghan et al., 2024; Sirois, 2023).

To the best of our knowledge, this is the first study which attempts to investigate the association between problematic TikTok use, and procrastination, loneliness and self-esteem and approach it via a stratification analysis by sex and generation.

2. Materials and Methods

2.1. Study Design

We conducted a web-based cross-sectional study in Greece, utilizing an online version of the study questionnaire developed through Google forms, which was disseminated via TikTok. Specifically, we produced a TikTok video to inform users about our study. Participants were required to be adults over the age of 18. The Google forms link was sent to interested TikTok users through inbox messages. Prior to commencing the online survey, participants were presented with an introductory page containing essential information. This page detailed the study's purpose and design, provided a brief overview of the questions, estimated the time required to complete the questionnaire, emphasized the voluntary nature of participation, and informed participants of their ability to exit the survey by closing their web browser. Additionally, our contact information was provided to the participants. To ensure data integrity, we inquired whether participants had previously completed the survey, and any affirmative responses were subsequently excluded from the dataset, resulting in a convenience sample. Data collection occurred from January to March 2025.

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We applied the Reporting of Observational Studies in Epidemiology (STROBE) (Vandenbroucke et al., 2007) to perform our study.

We used G*Power v.3.1.9.2 to calculate our sample size. Considering a small effect size between problematic TikTok use, and procrastination, loneliness and self-esteem ($f^2 = 0.02$), the number of independent variables (one predictor and seven confounders), a confidence level of 99%, and a margin error of 5%, sample size was estimated at 921 participants.

2.2. Measurements

We assessed problematic TikTok use using the TikTok Addiction Scale (TTAS), which consists of 15 items and evaluates six dimensions: salience (two items), mood modification (two items), tolerance (three items), withdrawal symptoms (two items), conflict (four items), and relapse (two items) (Galanis et al., 2024). Salience pertains to users' preoccupation with TikTok, while mood modification refers to its ability to improve emotional well-being. Tolerance is evident when users need to engage more with TikTok to feel satisfied, and withdrawal is characterized by negative feelings when they stop using it. Conflict occurs when TikTok disrupts daily life, while relapse is when users revert to previous usage patterns after abstaining. The TTAS evaluates individuals' attitudes towards TikTok over the past year, with responses on a five-point Likert scale from 1 (very rarely) to 5 (very often). Scores for the TTAS and the six factors range from 1 to 5, with higher scores indicating more problematic TikTok use. A cut-off score of 3.23 is suggested to differentiate between healthy and problematic users (Galanis et al., 2024). We used the valid Greek version of the TTAS (Katsiroumpa et al., 2025). In our study, the TTAS had a Cronbach's alpha of 0.944, and the six factors had Cronbach's alphas ranging from 0.689 to 0.911.

We measured procrastination with the Irrational Procrastination Scale (IPS) (Steel, 2010). The IPS includes nine items, such as "I delay tasks beyond what is reasonable", and "I do everything when I believe it needs to be done". Answers are on a five-point Likert scale from 1 (very seldom or not true of me) to 5 (very often true, or true of me). Total score on the IPS ranges from 9 to 45, with higher scores indicating higher levels of procrastination. We used the valid Greek version of the IPS (Katsiroumpa et al, 2025). In our study, the TTAS had a Cronbach's alpha of 0.893.

We measured loneliness with the UCLA 3-Item Loneliness Scale (UCLA-LS-3) (Hughes et al., 2004). The UCLA-LS-3 includes three items, such as "How often do you feel that you lack companionship?", and "How often do you feel left out?". Answers are on a three-point Likert scale from 1 (hardly ever) to 3 (often). Total score on the UCLA-LS-3 ranges from 3 to 9, with higher scores indicating higher levels of loneliness. We used the valid Greek version of the UCLA-LS-3 (Katsiroumpa et al., 2025). In our study, the UCLA-LS-3 had a Cronbach's alpha of 0.807.

We measured self-esteem with the Rosenberg Self-Esteem Scale (RSES) (Rosenberg, 1965). The RSES includes 10 items, such as "On the whole, I am satisfied with myself", and "I feel that I have a number of good qualities". Answers are on a four-point Likert scale from 1 (strongly disagree) to 4 (strongly agree). Total score on the PSES ranges from 10 to 40, with higher scores indicating higher levels of self-esteem. We used the valid Greek version of the RSES (Galanou et al., 2014). In our study, the PSES had a Cronbach's alpha of 0.888.

We considered as potential confounders the following variables: sex (females or males), age (continuous variable), educational level (elementary school, high school, University degree, MSc diploma or PhD diploma), socioeconomic status, TikTok use per day (continuous variable), social media use per day (continuous variable), and total number of social media accounts (continuous variable). We measured socioeconomic status with a simple question; "How do you consider your socioeconomic status?". Answers were on a scale from 0 to 10 where 0 referred to the worst socioeconomic status, and 10 to the best socioeconomic status.

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2.3. Ethical Issues

We conducted our study according to the guidelines of the Declaration of Helsinki ('World Medical Association Declaration of Helsinki', 2013). Our study protocol was approved by the Ethics Committee of the Faculty of Nursing, National and Kapodistrian University of Athens (approval number; 05, October 10; 2024). Participants were informed about the study design and asked to consent to participate. Specifically, before accessing the online questionnaire, TikTok users were asked via Google Forms if they agreed to participate. Those who consented were allowed to complete the questionnaire, thereby obtaining informed consent. Furthermore, no personal data were collected from participants, ensuring that participation was both voluntary and anonymous.

2.4. Statistical Analysis

We present categorical variables as numbers (n) and percentages (%), and continuous variables with mean, standard deviation (SD), median, interquartile range, along with skewness and kurtosis. We used the Kolmogorov-Smirnov test and Q-Q plots to assess the distribution of continuous variables. We considered TikTok addiction as the independent variable. We found moderate to high correlations between the six factors on the TTAS since correlation coefficients ranged from 0.554 to 0.771 (p-value < 0.001 in all cases). Thus, to avoid multicollinearity in the multivariable regression models we chose to use the score on the TTAS as the independent variable. Our dependent variables were procrastination, loneliness and self-esteem scores. Sex, age, educational level, socioeconomic status, TikTok use per day, social media use per day, and total number of social media accounts were considered as potential confounders. Since the dependent variables were continuous and normally distributed, we applied linear regression analysis, presenting unadjusted and adjusted beta coefficients, 95% confidence intervals (CI), and p-values. All multivariable models were adjusted for the confounders. We used variance inflation factors (VIFs) to check for multicollinearity in the multivariable models, with VIFs over 4 indicating multicollinearity (J. H. Kim, 2019). The VIFs for the final models ranged from 1.071 to 1.614, indicating no multicollinearity issues. Moreover, we performed a stratification analysis to explore differences between sexes and generations. We categorized our participants into three age generations. In particular, Generation Z referred to people born between 1997 and 2012, Millennials referred to people born between 1981 and 1996, and Generation X referred to people born between 1965 and 1980 (Dimock, 2019). Additionally, we used independent samples t-test to examine differences on TikTok use, social media use, and study scales between the two sexes and the three generations. Regarding generations, first we performed analysis of variance, and then we conducted independent samples t-test between two groups applying Bonferroni correction. We calculated Pearson's correlation coefficient to examine correlation between continuous variables. P-values less than 0.05 were considered statistically significant. We used the IBM SPSS 28.0 (IBM Corp. Released 2021. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp) for analysis.

3. Results

3.1. Demographic Characteristics

Our study population included 1033 participants. Table 1 shows demographic characteristics of our participants. In our sample, 75.4% were females, while 24.6 were males. Mean age was 31.1 years (SD; 12.4), with a median of 26.0 years. Most participants belonged to Generation Z (53.6%), while 28.6% belonged to Millennials, and 17.8% belonged to Generation X. Among our participants, 60.4% possessed a University degree, while 39.6% attended high school. Mean value on the socioeconomic status scale denoted a moderate level.

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Table 1. Demographic characteristics of our participants (N=1033).

Characteristics	N	%
Sex		
Females	779	75.4
Males	254	24.6
Age[a]	31.1	12.4
Age categories		
Generation Z	554	53.6
Millennials	295	28.6
Generation X	184	17.8
Educational level		
High school	409	39.6
University degree	373	36.1
MSc diploma	229	22.2
PhD diploma	22	2.1
Socioeconomic status[a]	6.2	1.5

[a] mean, standard deviation.

3.2. Social Media Characteristics

Table 2 presents social media characteristics of our participants stratified by sex and generation.

Table 2. Social media characteristics of our participants stratified by sex and generation (N=1033).

Characteristics	Mean	Standard Deviation	P-Value[a]
TikTok use per day (hours)	1.8	1.5	
Females (n=779)	1.8	1.5	0.238
Males (n=254)	1.7	1.5	
Generation Z (n=554)	2.3	1.7	
Millennials (n=295)	1.3	1.1	<0.001[b] for all comparisons between the three groups
Generation X (n=184)	0.8	0.5	
Social media use per day (hours)	3.3	1.9	
Females (n=779)	3.4	1.9	0.356
Males (n=254)	3.3	1.8	
Generation Z (n=554)	4.0	1.8	
Millennials (n=295)	2.9	1.7	<0.001[b] for all comparisons between the three groups
Generation X (n=184)	2.1	1.4	
Social media accounts	3.6	1.5	
Females (n=779)	3.6	1.5	0.011
Males (n=254)	3.9	1.7	
Generation Z (n=554)	3.8	1.5	<0.001[b] for comparisons between Generation Z and X, and between Millennials and Generation X
Millennials (n=295)	3.7	1.5	
Generation X (n=184)	3.1	1.4	

[a] independent samples t-test; [b] p-values after Bonferroni correction.

Mean TikTok use per day was 1.8 hours (SD; 1.5), with a median of one hour, a minimum value of 30 minutes, and a maximum value of 8.0 hours. Mean TikTok use per day was 1.8 hours for females and 1.7 hours for males (p-value = 0.238). Mean TikTok use per day was 2.3 hours for Generation Z, 1.3 hours for Millennials, and 0.8 hours for Generation X (p-value < 0.001 for differences between all groups).

The mean social media use per day was 3.3 hours (SD; 1.9), with a median of 3.0 hours, a minimum value of 30 minutes, and a maximum value of 8.0 hours. Mean social media use per day was 3.4 hours for females and 3.3 hours for males (p-value = 0.356). Mean social media use per day

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was 4.0 hours for Generation Z, 2.9 hours for Millennials, and 2.1 hours for Generation X (p-value < 0.001 for differences between all groups).

Most of participants (92.9%, n=960) had accounts on at least two social media platforms. In particular, 7.1% (n=73) had an account only on TikTok, 15.8% (n=163) had accounts on two social media platforms, 28.0% (n=289) on three social media platforms, 21.9% (n=226) on four social media platforms, 15.4% (n=159) on five social media platforms, and 11.9% (n=123) on 6-8 social media platforms. Mean number of accounts was 3.6 (SD; 1.5), with a median of 3.0, a minimum value of 1, and a maximum value of 8. Mean number of accounts was 3.6 for females and 3.9 for males (p-value = 0.011). Mean number of accounts was 3.8 for Generation Z, 3.7 for Millennials, and 3.1 for Generation X (p-value < 0.001 for differences between Generation Z and X, and between Millennials and Generation X).

3.3. Study Scales

Descriptive statistics for the study scales are shown in Table 3. Among our participants, 11.3% (n=117) had a score on TTAS higher than the cut-off point of 3.23, indicating problematic TikTok users, while 88.7% (n=916) had a score lower than the cut-off point indicating healthy users. Participants scored higher on factors "mood modification" and "tolerance", followed by factors "conflict", "salience", "relapse", and "withdrawal symptoms". We did not found difference on TTAS score between females (mean; 1.95, SD; 0.79) and males (mean; 1.98, SD; 0.84), (p-value = 0.643). Generation Z (mean; 2.30, SD; 0.83) showed higher scores on TTAS than Millennials (mean; 1.66, SD; 0.58) and Generation X (mean; 1.38, SD; 0.36), (p-value < 0.001 in all cases).

Table 3. Descriptive statistics for our study scales (N=1033).

Scale	Mean	Standard Deviation	Median	Interquartile Range	Skewness	Kurtosis
TikTok Addiction Scale	1.95	0.80	1.73	1.07	1.05	0.57
Salience	1.70	0.82	1.50	1.00	1.36	1.61
Mood modification	2.81	1.06	3.00	1.50	-0.02	-0.74
Tolerance	2.33	1.13	2.00	1.67	0.60	-0.69
Withdrawal symptoms	1.33	0.62	1.00	0.50	2.31	6.02
Conflict	1.92	1.02	1.50	1.50	1.18	0.57
Relapse	1.48	0.82	1.00	1.00	2.10	4.59
Irrational Procrastination Scale	23.92	7.31	24.00	10.00	0.31	-0.29
UCLA 3-Item Loneliness Scale	4.92	1.79	5.00	3.00	0.72	-0.41
Rosenberg Self-Esteem Scale	30.07	5.35	30.00	7.00	-0.42	0.45

Mean score on Irrational Procrastination Scale indicated moderate levels of procrastination. Mean score on UCLA 3-Item Loneliness Scale indicated low to moderate levels of loneliness. Mean score on Rosenberg Self-Esteem Scale indicated moderate levels of self-esteem.

3.4. Correlation Between Study Scales

Table 4 shows correlation between TikTok addiction score and procrastination score, loneliness score and self-esteem score. We found a positive correlation between TikTok addiction score and procrastination score (r = 0.479, p-value < 0.001). This correlation was stronger among females and Generation Z. Similarly, we found a positive correlation between TikTok addiction score and loneliness score (r = 0.316, p-value < 0.001). This correlation was stronger among males and Generation X. Our findings showed a negative correlation between TikTok addiction score and self-esteem score (r = -0.254, p-value < 0.001). This correlation was stronger among males and Generation Z.

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Table 4. Correlation matrix between TikTok addiction score and procrastination score, loneliness score and self-esteem score (N=1033).

	Procrastination Score	Loneliness Score	Self-Esteem Score
Full sample (n=1033)	0.479*	0.316*	-0.254*
Females (n=779)	0.500*	0.289*	-0.233*
Males (n=254)	0.473*	0.417*	-0.338*
Generation Z (n=554)	0.569*	0.312*	-0.326*
Millennials (n=295)	0.315*	0.312*	-0.158**
Generation X (n=184)	0.283*	0.367*	-0.090

Values are expressed as Pearson's correlation coefficients. Coefficients were adjusted for sex, age, educational level, socioeconomic status, TikTok use per day, social media use per day, and social media accounts. * p-value < 0.001; ** p-value < 0.01.

3.5. Association Between Problematic TikTok Use and Procrastination

Table 5 shows linear regression models with procrastination score as the dependent variable. Our multivariable model in the full sample identified a positive association between problematic TikTok use and procrastination (adjusted coefficient beta = 4.976, 95% CI = 4.416 to 5.535, p-value < 0.001). Stratification analysis showed that the association between problematic TikTok use and procrastination was stronger among females (adjusted coefficient beta = 5.182, 95% CI = 4.500 to 5.863, p-value < 0.001) than males (adjusted coefficient beta = 4.507, 95% CI = 3.529 to 5.485, p-value < 0.001). Additionally, our stratified models identified a stronger association between problematic TikTok use and procrastination in Generation Z (adjusted coefficient beta = 5.411, 95% CI = 4.755 to 6.067, p-value < 0.001) than Millennials (adjusted coefficient beta = 4.049, 95% CI = 2.635 to 5.462, p-value < 0.001), and Generation X (adjusted coefficient beta = 4.389, 95% CI = 2.186 to 6.592, p-value = 0.003).

Table 5. Linear regression models with procrastination score as the dependent variable.

Predictor: TTAS	Univariate Model			Multivariable Model[a]					
	Unadjusted Coefficient Beta	95% CI for Beta	P-Value	Adjusted Coefficient Beta	95% CI for Beta	P-Value	VIF	R^2 (%)	P-Value for ANOVA
Full sample (n=1033)	5.304	4.847 to 5.761	<0.001	4.976	4.416 to 5.535	<0.001	1.550	35.6	<0.001
Females (n=779)	5.358	4.816 to 5.899	<0.001	5.182	4.500 to 5.863	<0.001	1.614	33.8	<0.001
Males (n=254)	5.123	4.286 to 5.960	<0.001	4.507	3.529 to 5.485	<0.001	1.444	39.8	<0.001
Generation Z (n=554)	5.438	4.839 to 6.036	<0.001	5.411	4.755 to 6.067	<0.001	1.253	39.0	<0.001
Millennials (n=295)	4.607	3.333 to 5.881	<0.001	4.049	2.635 to 5.462	<0.001	1.278	17.6	<0.001
Generation X (n=184)	4.332	2.207 to 6.456	<0.001	4.389	2.186 to 6.592	<0.001	1.071	7.3	0.003

[a] Multivariable models are adjusted for sex, age, educational level, socioeconomic status, TikTok use per day, social media use per day, and social media accounts. CI: confidence interval, TTAS: TikTok Addiction Scale, VIF: variance inflation factor.

3.6. Association Between Problematic TikTok Use and Loneliness

Table 6 shows linear regression models with loneliness score as the dependent variable. After elimination of confounders, we found a positive association between problematic TikTok use and loneliness in the full sample (adjusted coefficient beta = 0.845, 95% CI = 0.689 to 1.000, p-value < 0.001). After stratification, this positive association remained for both sexes but was stronger among males (adjusted coefficient beta = 1.014, 95% CI = 0.737 to 1.290, p-value < 0.001) than females (adjusted

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coefficient beta = 0.802, 95% CI = 0.615 to 0.990, p-value < 0.001). Moreover, stratification analysis showed that the association between problematic TikTok use and loneliness was stronger in Generation X (adjusted coefficient beta = 1.336, 95% CI = 0.732 to 1.940, p-value < 0.001) than the other two generations.

Table 6. Linear regression models with loneliness score as the dependent variable.

Predictor: TTAS	Univariate Model			Multivariable Model[a]					
	Unadjusted Coefficient Beta	95% CI for Beta	P-Value	Adjusted Coefficient Beta	95% CI for Beta	P-Value	VIF	R^2 (%)	P-Value for ANOVA
Full sample (n=1033)	0.865	0.738 to 0.992	<0.001	0.845	0.689 to 1.000	<0.001	1.550	17.3	<0.001
Females (n=779)	0.805	0.656 to 0.954	<0.001	0.802	0.615 to 0.990	<0.001	1.614	14.2	<0.001
Males (n=254)	1.031	0.793 to 1.270	<0.001	1.014	0.737 to 1.290	<0.001	1.444	27.5	<0.001
Generation Z (n=554)	0.758	0.580 to 0.935	<0.001	0.761	0.567 to 0.956	<0.001	1.253	14.6	<0.001
Millennials (n=295)	1.195	0.885 to 1.504	<0.001	1.169	0.825 to 1.512	<0.001	1.278	19.3	<0.001
Generation X (n=184)	1.321	0.742 to 1.900	<0.001	1.336	0.732 to 1.940	<0.001	1.071	8.1	0.002

[a] Multivariable models are adjusted for sex, age, educational level, socioeconomic status, TikTok use per day, social media use per day, and social media accounts; CI: confidence interval, TTAS: TikTok Addiction Scale, VIF: variance inflation factor.

3.7. Association Between Problematic TikTok Use and Self-Esteem

Table 7 shows linear regression models with self-esteem score as the dependent variable. The final multivariable linear regression model in the full sample showed a negative association between problematic TikTok use and self-esteem (adjusted coefficient beta = -1.929, 95% CI = -2.379 to -1.480, p-value < 0.001). This association was stronger among males (adjusted coefficient beta = -2.388, 95% CI = -3.220 to -1.556, p-value < 0.001) and Generation Z (adjusted coefficient beta = -2.262, 95% CI = -2.812 to -1.711, p-value < 0.001).

Table 7. Linear regression models with self-esteem score as the dependent variable.

Predictor: TTAS	Univariate Model			Multivariable Model[a]					
	Unadjusted Coefficient Beta	95% CI for Beta	P-Value	Adjusted Coefficient Beta	95% CI For Beta	P-Value	VIF	R^2 (%)	P-value for ANOVA
Full sample (n=1033)	-2.592	-2.970 to -2.214	<0.001	-1.929	-2.379 to -1.480	<0.001	1.550	22.3	<0.001
Females (n=779)	-2.436	-2.869 to -2.002	<0.001	-1.810	-2.344 to -1.276	<0.001	1.614	18.7	<0.001
Males (n=254)	-3.032	-3.802 to -2.261	<0.001	-2.388	-3.220 to -1.556	<0.001	1.444	34.5	<0.001
Generation Z (n=554)	-2.247	-2.762 to -1.733	<0.001	-2.262	-2.812 to -1.711	<0.001	1.253	19.2	<0.001
Millennials (n=295)	-1.885	-2.859 to -0.911	<0.001	-1.460	-2.521 to -0.399	<0.001	1.278	11.2	<0.001
Generation X (n=184)	-1.282	-2.957 to 0.394	0.133	-1.035	-2.744 to 0.673	0.233	1.071	3.6	0.05

[a] Multivariable models are adjusted for sex, age, educational level, socioeconomic status, TikTok use per day, social media use per day, and social media accounts; CI: confidence interval, TTAS: TikTok Addiction Scale, VIF: variance inflation factor.

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4. Discussion

TikTok daily use seems to have steady growth, largely among young generations. This immense spread underlines the major need for further investigation of TikTok's reflection to individuals' health status. For this reason, we conducted a web-based cross-sectional study in Greece. The questionnaire was disseminated via TikTok.

Since this study is the first to attempt to explore the association between problematic TikTok use, and procrastination, loneliness and self-esteem, via a stratification analysis by sex and generation, there were hardly similar studies in literature to compare with. Therefore, the findings of this study will be discussed and interpreted according to studies as close as possible, especially studies that investigated the association or association between problematic social media use and procrastination, loneliness and self-esteem among generations and genders.

Concerning daily use of TikTok, the sample had a mean time use of 1.8 hours, with minimum value being at 30 minutes and maximum value being at 8 hours. This finding aligns with other statistical sources concerning time on TikTok which declare that the time users devote to TikTok may span from 52 to 150 min or more (Statista, 2025; Oberlo, 2023; Statista, 2025; Statista, 2025). Female and male participants spent almost the same time on TikTok daily (1.8 hours and 1.7 hours respectively), while among generations it was shown that first comes Generation Z (2.3 hours), followed by the Millennials (1.3 hours) and last Generation X (0.8 hours). These results agree with general statistics, supporting that two genders share almost equal time on TikTok, with Generation Z having the largest period daily (Statista, 2025; Oberlo, 2023; Statista, 2025; Statista, 2025). It is of great interest that the mean daily use of social media in this study was 3.3 hours; since the mean for TikTok daily use was found to be 1.8 hours, it means that the participants devote more than half of their social media time to TikTok. Although 92.9% of the sample had at least two more accounts on other social media, they preferred spending more time on TikTok. This finding verifies previous studies and statistics which support that TikTok has prevailed over other social media, proving itself more interesting and addictive in contrast to other social media platforms (Wallaroomedia, 2024).

Concerning the sample and problematic TikTok use, it was found that 11.3% of the participants gathered score over the cut-off point of the TTAS, indicating problematic use. Although there were no significant differences between the two genders (TTAS mean score for females was 1.95 and for males was 1.98) Generation Z was proven to have higher levels of problematic use (mean; 2.30, SD; 0.83) than Millennials (mean; 1.66, SD; 0.58) and Generation X (mean; 1.38, SD; 0.36), confirming previous statistical comparisons between social media and TikTok use per generation (Statista, 2025; Statista, 2023). According to the results, the participants ranged higher score for factors "mood modification" and "tolerance", followed by factors "conflict", "salience", "relapse", and "withdrawal symptoms". These results practically show that the users choose to dive for long periods into TikTok because they feel good as they are distracted from the "real-world" and responsibilities. Also, tolerance refers to the amount of time required to feel good on TikTok. This amount starts to expand day by day (as happens with every addictive habit) leading to conflict between the joy of staying longer on TikTok and the need to go back to the real world and responsibilities. This conflict among with the essence of joy, is forcing them to "relapse" and surrender to TikTok (Statista, 2023; Statista, 2023; Campanella, 2024; Chung, 2018). This pattern has also been supported and explained by other studies and statistic data, which also support the addictive effect of social media and especially TikTok on users, foremost in young ages (Koetsier, 2020; Statista, 2023; Conte, 2025; Galanis et al., 2024; Chao et al., 2023). Alonzo et al. systematic review supported that there is an addictive side media use which is associated with poor mental health outcomes among young people (Alonzo et al., 2021). Salience was also found by Caponetto's et al. systematic review as a factor related to problematic TikTok use, responsible for potential addictive behaviors (Caponnetto et al., 2025).

Furthermore, our sample had moderate levels of procrastination, low to moderate levels of loneliness and moderate levels of self-esteem. According to our results, there was a positive correlation between TikTok addiction score, and procrastination score especially among females and Generation Z. These results indicate that the more time is spent on TikTok the more the users push

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their real-world responsibilities to the background of priorities. As shown earlier, generation Z is the one with the highest levels of TikTok use daily among all other generations. Furthermore, it is supported that women tend to procrastinate more than men due to a variety of reasons, such as stress, ideal standards of perfection etc. (Balkis & Duru, 2024; Flett et al., 2016; Niermann & Scheres, 2014). As literature supports, procrastination occurs either by failing to self-regulate or because of fear of missing out. Either way, users ignore their responsibilities and prioritize their time on TikTok and social media (Bao et al., 2025; Li & Ye, 2022). Literature has underlined that procrastination associated with social media addiction, frequently leads to poor sleep (Hale & Guan, 2015) and poor academic and school performance (Chao et al., 2023; Naushad et al., 2025; Zhou et al., 2024; Rasouli et al. 2025).

Another finding was that our sample indicated positive correlation between TikTok addiction score and loneliness score. This correlation was stronger among males and Generation X. According to statistic Generation X finds TikTok addictive, ending up "absorbed" (Statista, 2023). Both social media and TikTok, according to other studies, have been associated with loneliness outcomes for users leading to poor mental health, such as loneliness, depression, stress and poor sleep (Conte et al., 2025; Muñoz-Rodríguez et al., 2023; Harries et al., 2025; Chao et al., 2023). According to other studies individuals, and most frequently boys, are feeling isolated when they go offline and especially when they are away from social media (including TikTok) declaring lack of communication and a feeling of isolation (Conte et al., 2025; Muñoz-Rodríguez et al., 2023; Savoia et al., 2021; Sipal eta al., 2011). This feeling is attributed to the "fear of missing out" phenomenon, where individuals fear that they are missing important information and social updates when they go offline (Bao & Li, 2025; Li & Ye, 2022; Wu et al., 2025). Yet, this absorbance in the digital world costs a great load of real world's communication and interaction.

Finally, our results indicated a negative correlation between TikTok addiction and self-esteem. This correlation was stronger among males and Generation Z. This finding comes to be added to in the general context that TikTok affects mental health negatively, including self-esteem. More specifically, it is supported that the prolonged TikTok use leads users to immerse themselves in a digital world where unrealistic body and lifestyle standards dominate. This daily interaction with non-achievable standards and stereotypes drives them to self-esteem issues, body dissatisfaction and damaged self-perception (Calogero et al., 2011). Self-esteem issues due to addictive use of TikTok have also derived from Conte's et al. systematic review where TikTok has been appointed as a risk factor for poor mental health, body-image issues and low self-esteem (Conte et al., 2025). Both our study and previous studies in literature support that younger ages are more vulnerable to self-esteem issues, especially when it comes to TikTok (Statista, 2023; Chung, 2018; Bleidorn et al., 2016). Concerning self-esteem and gender, literature is divided into two parts. Generally, women seem to be more burden with self-esteem issues due to social and mental-related reasons, yet there are studies supporting that men suffer too from the social stereotypes, leading to low self-esteem (Bleidorn et al., 2016; Casale, 2020; Jouini et al., 2018; Kling et al., 1999; Li et al., 2022; Mayo, 2016; Roberts, 1991).

Our study had several limitations. First, we used a convenience sample of TikTok users in Greece. Although we covered the sample size requirements, our sample cannot be representative of TikTok users. For instance, our study included mainly females (75.4%), and, thus, this sex imbalance may introduce selection bias. Future studies should include random samples to produce more representative results. Second, we conducted a cross-sectional study, and, therefore, we cannot establish a causal relationship between problematic TikTok use, procrastination, loneliness and self-esteem. Thus, we cannot be sure whether problematic TikTok use affects procrastination, loneliness and self-esteem or whether these variables pre-exist and lead to increase problematic TikTok use. Longitudinal studies that explore the association between problematic TikTok use, procrastination, loneliness and self-esteem could add significant information. Third, we used valid tools to measure problematic TikTok use, procrastination, loneliness and self-esteem. However, our participants may compromise their answers due to social desirability bias. Therefore, information bias is probable in our study. Moreover, information bias may be introduced by the measurement of confounders. For instance, we measured socioeconomic status through a self-reported assessment. Fourth, we

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eliminated several confounders in our study, such as sex, age, educational level, socioeconomic status, TikTok use per day, social media use per day, and social media accounts. However, several other variables may introduce confounding in the association between problematic TikTok use, procrastination, loneliness and self-esteem. In this context, scholars should eliminate more confounders in future studies. For instance, personality characteristics, family members relationships, and sleep patterns may be considered as potential confounders. Finally, investigation of potential mediators in the association between problematic TikTok use, procrastination, loneliness and self-esteem may further add significant knowledge on the impact of TikTok use.

5. Conclusions

This study investigated the association between problematic TikTok use, and procrastination, loneliness and self-esteem, following a stratification analysis by sex and generation per factor. According to the results, a significant percentage of the sample was found above the cut-off point of the TTAS, displaying problematic use. Furthermore, we validated the levels of loneliness, self-esteem and procrastination of the sample which were moderated, and then we performed all the necessary statistical tests to investigate the associations between our factors. As per these statistical tests results, it was found that problematic TikTok use is associated in accordance with high levels of procrastination and loneliness. This practically means that the more time individuals spent on TikTok the more loneliness they experienced and the more procrastination towards their real-life responsibilities was. On the other hand, it was found negative association between self-esteem and TikTok. Meaning, that the more time users devoted to TikTok, the lower their self-esteem was. Finally, young people (Generation Z) and female participants were found to be more burden between most of the categories. For the needs of this study, we applied valid tools such as the TikTok Addiction Scale to identify high-risk TikTok users. We measured procrastination with the Irrational Procrastination Scale, loneliness with the UCLA 3-Item Loneliness Scale and self-esteem with the Rosenberg Self-Esteem Scale. This study aimed to enlighten and contribute to further understanding of the TikTok and its consequences. Interventions should be taken into consideration, in order to reduce the negative effect of problematic TikTok use on mental health. The present study faced a number of limitations, such as the cross-sectional nature of data, and thus, the findings should be examined under strict scrutiny. Further investigations should be carried out, such as Longitudinal studies, to reduce bias and improve knowledge and research in this field.

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Abbreviations

The following abbreviations are used in this manuscript:

CI	Confidence interval
IPS	Irrational Procrastination Scale
RSES	Rosenberg Self-Esteem Scale
TTAS	TikTok Addiction Scale
UCLA-LS-3	UCLA 3-Item Loneliness Scale
VIF	Variance inflation factor

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